

PREPARATION OF PARTICLES FOR INHALATION

Abstract of the Invention

Particles incorporating a surfactant and/or a hydrophilic or hydrophobic complex of a positively or negatively charged therapeutic agent and a charged molecule of opposite charge for drug delivery to the pulmonary system, and methods for their synthesis and administration are provided. In a preferred embodiment, the particles are made of a biodegradable material and have a tap density less than 0.4 g/cm^3 and a mass mean diameter between $5 \mu\text{m}$ and $30 \mu\text{m}$, which together yield an aerodynamic diameter of the particles of between approximately one and three microns. The particles may be formed of biodegradable materials such as biodegradable polymers. For example, the particles may be formed of poly(lactic acid) or poly(glycolic acid) or copolymers thereof. Alternatively, the particles may be formed solely of a therapeutic or diagnostic agent and a surfactant. Surfactants can be incorporated on the particle surface for example by coating the particle after particle formation, or by incorporating the surfactant in the material forming the particle prior to formation of the particle. Exemplary surfactants include phosphoglycerides such as dipalmitoyl phosphatidylcholine (DPPC). The particles can be effectively aerosolized for administration to the respiratory tract to permit systemic or local delivery of wide a variety of therapeutic agents. Formation of complexes of positively or negatively charged therapeutic agents with molecules of opposite charge can allow control of the release rate of the agents into the blood stream following administration.